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Final Work Plan and Sampling and Analysis Plan Soil and Groundwater Background Investigation Atlantic Fleet Weapons Training Facility Vieques Island, Puerto Rico

Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

Under the
LANTDIV CLEAN II Program
Contract No. N62470-95-D-6007
CTO-031

Prepared by

CH2MHILL

Tampa, Florida

September 6, 2001

Final

Work Plan

and

Sampling and Analysis Plan

Soil and Groundwater Background Investigation

Atlantic Fleet Weapons Training Facility
Vieques, Puerto Rico

CTO Task Order 031

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List of Acronyms

AFWTF	Atlantic Fleet Weapons Training Facility
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
COC	Contaminants of concern
DQE	Data quality evaluation
DQO	Data quality objective
EPA	U.S. Environmental Protection Agency
FSP	Master Field Sampling Plan
GIS	Geographic Information System
GPS	Global positioning system
HASP	Master Health and Safety Plan
IDWP	Master Investigation-Derived Waste Plan
IR	Installation restoration
LCSs	Laboratory confirmation samples
LANTDIV	Atlantic Division
MDL	Method detection limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MWP	Master Work Plan
NAD 83	North American Datum 83
NAVFACENGCOM	Naval Facilities Engineering Command
NFESC	Naval Facilities Engineering Support Command
NGVD	National Geodetic Vertical Datum
NTR	Navy Technical Representative
PDFs	Probability Density Functions
PI	Photo identified
PPE	Personal Protective Equipment
PWC	Public Works Center
QA/QC	Quality Assurance/Quality Control
QAPP	Master Quality Assurance Project Plan
RL	Reporting limit
SOPs	Standard Operating Procedures
TM	Technical Memorandum
WP	Work Plan
WRS	Wilcoxon rank sum

SECTION 1

Introduction

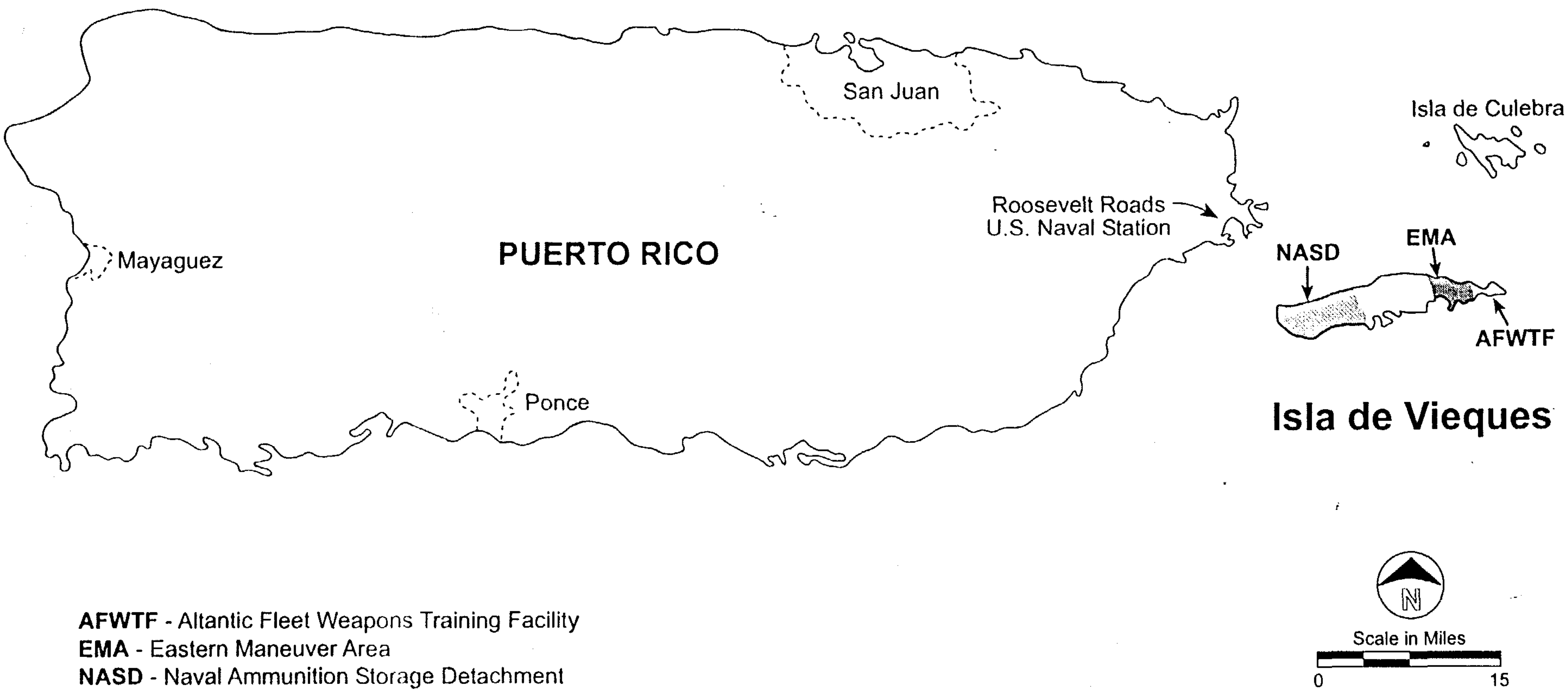
This Work Plan describes the work that will be completed for the background investigation of soils and groundwater at the Atlantic Fleet Weapons Training Facility (AFWTF), Vieques, Puerto Rico. This Work Plan is prepared under the Naval Facilities Engineering Command (NAVFACENGCOM) LANTDIV Navy Contract N62470-95-D-6007, Navy Comprehensive Long-Term Environmental Action Navy (CLEAN), District III, Contract Task Order 031. The technical approach is based on *Procedural Guidance for Statistically Analyzing Environmental Background Data*, published by the NAVFACENGCOM in 1998. The purpose of this Work Plan is to outline the procedures that will be used to establish background conditions for application to site sampling data to identify release-related site constituents of concern and human health and ecological risks. The background data will be utilized in conjunction with the Phase I RFI data, and if required, full RFI data, to assess if the inorganic constituents detected at the SWMUs are related to SWMU activities, or are naturally occurring.

The general background and physical setting of AFWTF is described in Sections 2 and 3 of the Master Project Plans, prepared by CH2M HILL in February 2001. A regional location map of AFWTF is provided as Figure 1-1, and a facility map is provided as Figure 1-2. Previous investigations at AFWTF have revealed that elevated levels of metals have been detected in the soils at several IR site locations. However, these investigations have not differentiated the degree to which these constituents were attributed either to site conditions or background conditions associated with naturally occurring constituents.

1.1 Purpose and Objectives

The purpose of the background sampling program is to provide sufficient data to establish representative background concentration data for naturally occurring constituents or for constituents not associated with AFWTF activities. Inorganic constituent concentrations detected in various media as part of the remedial investigations at the site will be compared to background data to evaluate whether the reported concentrations of those constituents were caused by AFWTF operations or by ambient effects, including natural conditions at this portion of the island. In this process, establishing background conditions early is essential to identify release-related contaminants of concern (COC), estimate human health and ecological risks, analyze compliance with regulatory standards, evaluate remedial alternatives, and develop appropriate cleanup levels.

One of the principle objectives of the background analyses is to eliminate background chemicals from subsequent phases of the investigation and remedial process as early as possible, thereby focusing risk assessments and remedial alternative selection on those constituents associated with a release. Eliminating background chemicals early in the process will reduce the number of chemicals that require further analysis, and decrease the complexity, time, and cost associated with future investigations and remedial activities.



AFWTF - Altantic Fleet Weapons Training Facility
EMA - Eastern Maneuver Area
NASD - Naval Ammunition Storage Detachment

Figure 1-1
SITE LOCATION MAP
Vieques Island, Puerto Rico

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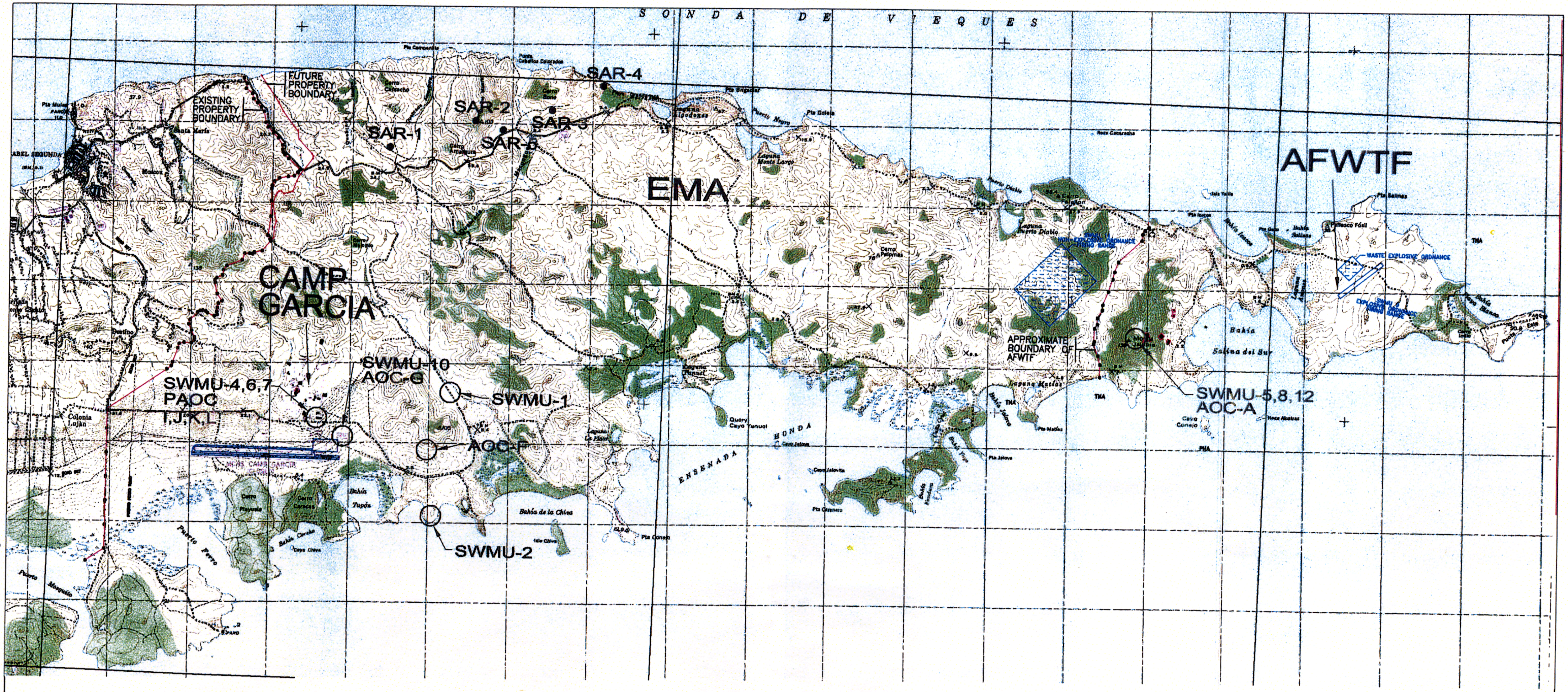

Legend:

EMA – Eastern Maneuver Area.
AFWTF – Atlantic Fleet Weapons Training Facility.
SWMU – SOLID WASTE MANAGEMENT UNIT
AOC – AREA OF CONCERN
PAOC – POTENTIAL AREA OF CONCERN
SAR – SMALL ARMS RANGE

NOTE:
SITES I,J,K, AND L ARE POTENTIAL AREAS OF CONCERN. THESE SITES WILL REQUIRE FURTHER INVESTIGATION TO DETERMINE WHETHER RELEASE OF HAZARDOUS MATERIAL HAS OCCURRED AT EACH RESPECTIVE SITE.

SWMU'S 3,9, AND 11 ARE ILLUSTRATED TO PROVIDE THE LOCATION RELATIVE TO OTHER SWMUS. THESE SITES ARE LOCATED WITHIN THE LIVE IMPACT AREA AND WILL NOT BE INVESTIGATED DURING THE PHASE IRF I.

N

0 4000 ft.

P:\Environmental\154373 – Drawings\Puerto Rico\Viequez\Vieqsite4.dwg

Figure 1-2
SITE LOCATION MAP
Atlantic Fleet Weapons Training Facility, Vieques Island

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SECTION 2

Sampling Rationale and Sampling Locations

This section presents the rationale and sampling locations for the background investigation at AFWTF. Several factors must be considered when potential background sampling areas are identified. The most important include geological and hydrogeological features, upgradient sources of contamination, and anthropogenic impacts on background areas or background sampling locations onsite. Correctly matching the geologic and hydrogeologic underlying conditions will generally ensure that background and site data have similar chemical properties so that any differences in chemical concentrations may be attributable to site activities and releases. The effects of potential upgradient sources must also be evaluated. If a potential background area is affected by an upgradient but non-site-related chemical source, background samples may contain chemicals that invalidate the area as background. To support the selection of background sample locations, site geology and aerial photographs were reviewed, as discussed in Sections 2.1 and 2.2. The remainder of this section discusses the sample location selection and rationale.

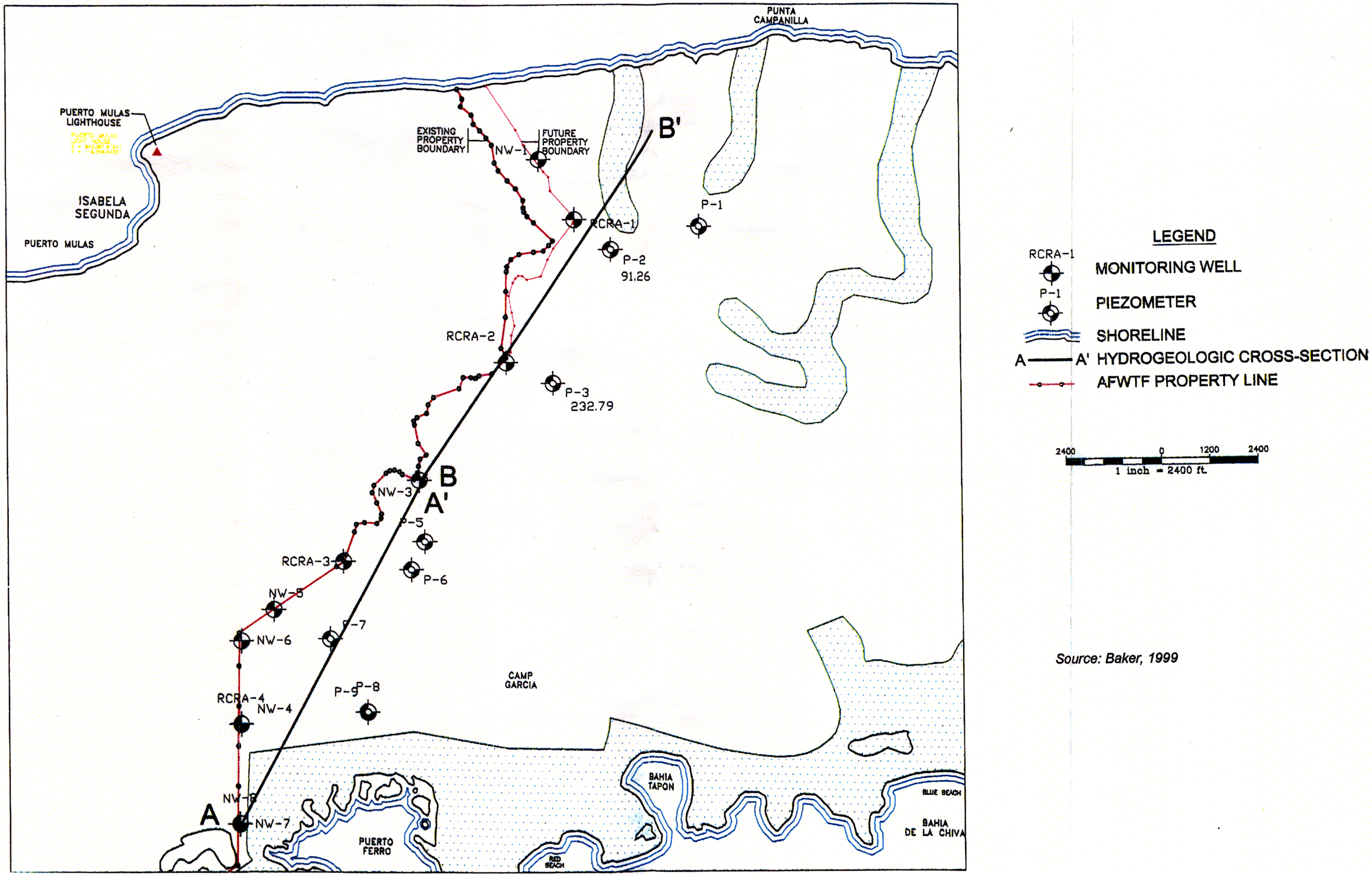
2.1 Hydrogeology and Soils

The geology at AFWTF is characterized by volcanic and plutonic bedrock overlain by alluvial unconsolidated sediments. The volcanic bedrock consists primarily of andesites of Cretaceous age (Briggs and Akers, 1965). The plutonic bedrock consists largely of granodiorite and quartz-diorite that is exposed over a large percentage of the island. The alluvium consists of a mixture of sand, silt, and clay.

Hydrogeologic cross-sections constructed from well installation logs are presented in Figures 2-1 through 2-3. As shown in the cross sections, the thickness of the unconsolidated layer decreases northward from wells NW-7 and NW-4 located along the Caribbean shoreline to well NW-3, located at the highest elevation within the study area. Likewise, the thickness of the unconsolidated layer increases again northward from NW-3 toward NW-1 located near the Atlantic Ocean shoreline (Baker, 1999).

As part of the previous hydrogeologic investigation, groundwater elevation measurements were recorded on August 26, 1999. The depth to groundwater within the bedrock ranged from approximately 36 feet at NW-5 to 131 feet at P-1. The groundwater elevations of the bedrock are significantly higher than the elevations where groundwater was encountered during drilling. This would indicate that the bedrock formation is under artesian conditions. The groundwater elevation data for the bedrock indicates that a groundwater flow divide exists within the bedrock at the approximate north/south mid point of the island: at the location of well NW-3. Generally, groundwater north of well NW-3 flows north toward the Atlantic Ocean and groundwater south of NW-3 flows south toward the Caribbean Sea.

Two groundwater aquifers are present in the AFWTF area of Vieques, and include the shallow unconsolidated alluvial deposits near the Caribbean coast and the deeper bedrock aquifer system northward from the coast. Bedrock in the AFWTF area is predominantly



Source: Baker, 1999

FIGURE 2-1
Hydrogeologic Cross-Section Location Map
Vieques Island, Puerto Rico

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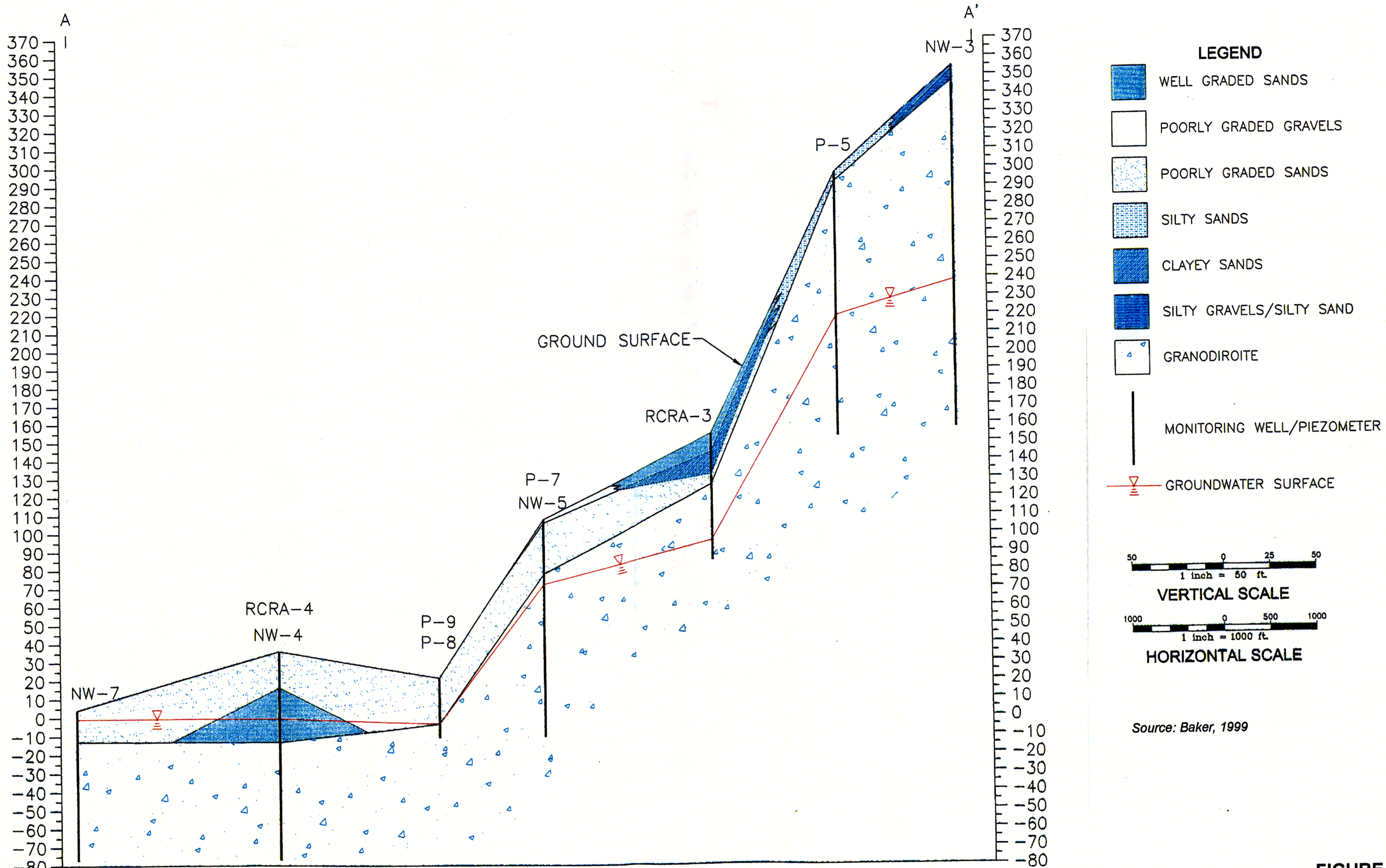
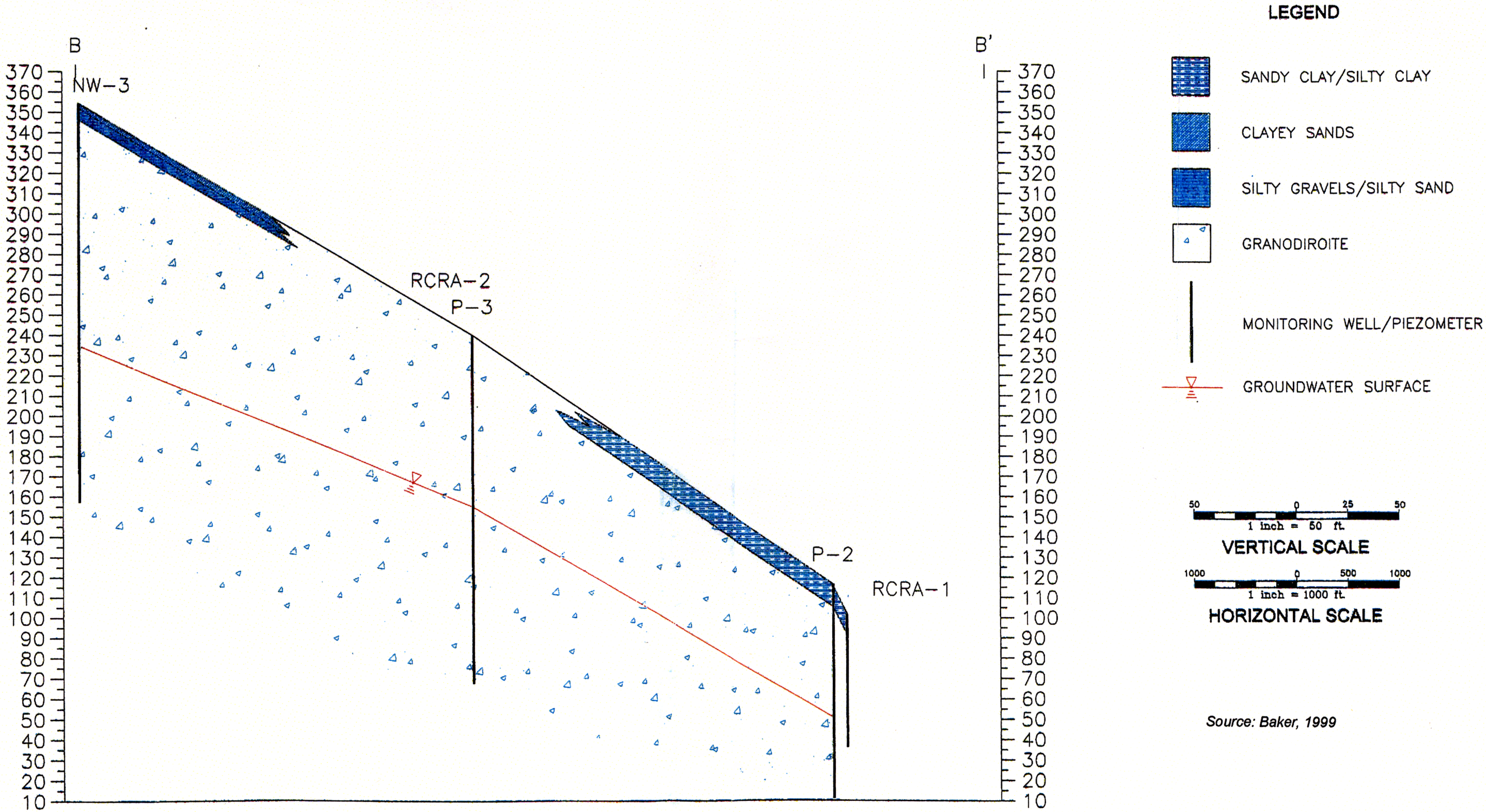


Source: Baker, 1999

FIGURE 2-2
Hydrogeologic Cross-Section A-A'
Vieques Island, Puerto Rico



Source: Baker, 1999

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FIGURE 2-3
Hydrogeologic Cross-Section B-B'
Vieques Island, Puerto Rico

unweathered, highly impermeable granodiorite; the porosity is very low, and the potential for groundwater development is limited. Toward the coast, clayey alluvium overlies the granodiorite. Samples from wells in the Camp Garcia area show mostly saline water in the clayey alluvium.

Groundwater wells proposed for the RCRA Facility Investigations (RFIs) will be constructed using 10-foot well screen lengths screened across the top of the water table. The location of these RFI sites will place all RFI wells in the bedrock. Therefore, the wells proposed for sampling as part of the background study will be screened within the same geologic formation and relative depth.

To ensure that background and installation restoration (IR) site soils are of similar soil composition, the Soil Conservation Service *Soil Survey of Humacao Area of Eastern Puerto Rico* was reviewed to identify site soil characteristics for surficial soils. Based on these reviews, five general categories of soil types were identified:

1. Qa - Alluvial deposits (sand, silt, and clay)
2. Qb - Beach and dune deposits (calcite, quartz, volcanic rock fragments and minor magnetite)
3. TI - Marine sedimentary rocks (report indicated to variable to describe)
4. Kv - Sandstone, siltstone, conglomerate, lava, tuff, and tuffaceous breccia
5. KTd - Plutonic rock made up largely of granidiorite and quartz diorite

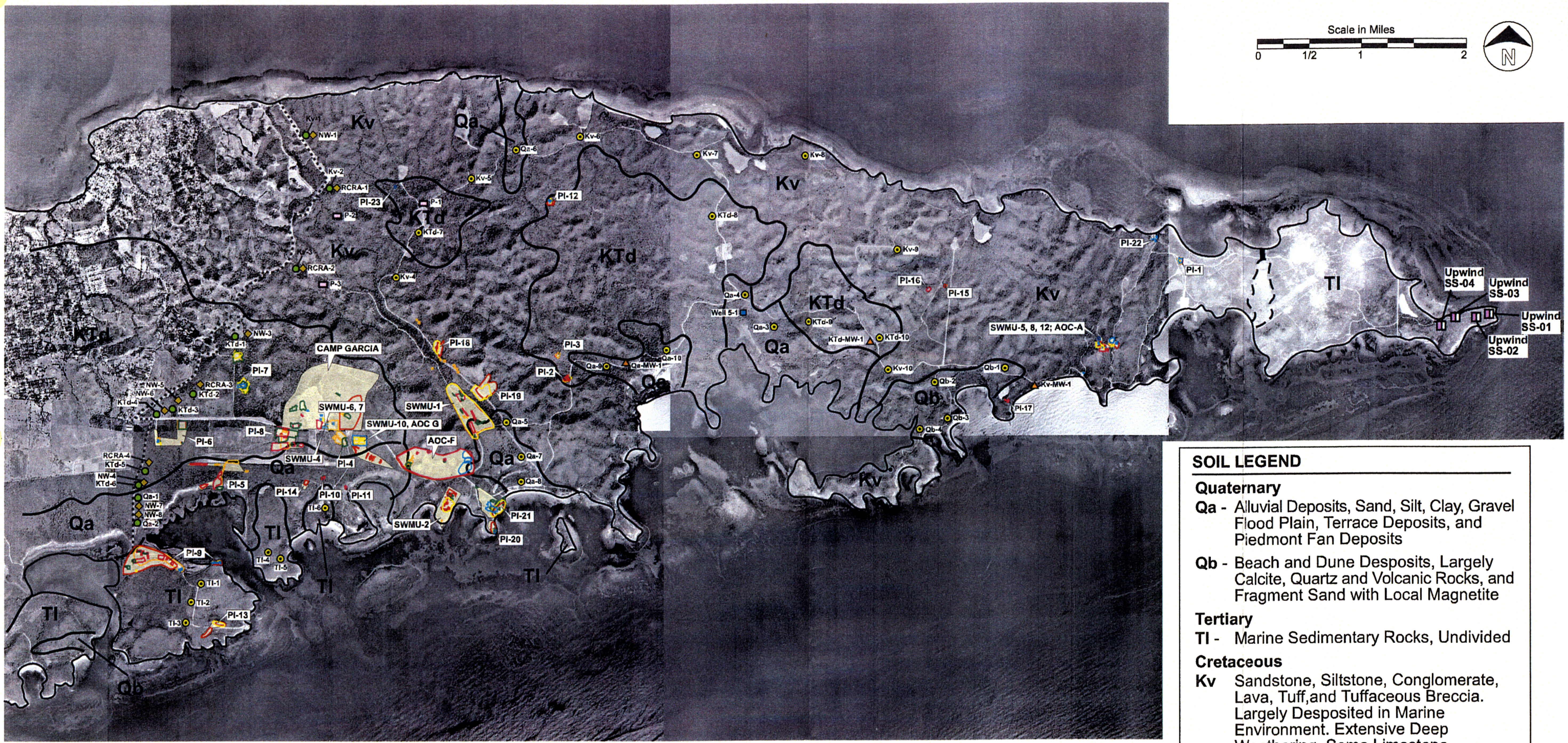
Figure 2-4 shows the extent of each soil type in relation to the IR sites. A review of IR site locations show that SWMUs 4, 6, 7, and 10, and AOC G are located in soil types identified as KTd. SWMUs 1 and 2, and AOC F are located in soil types identified as Kv. No IR sites are located in soil types identified as Qa, Qb, or TI.

Limited information regarding the alluvial deposits is available for Vieques other than the generalized soil types map prepared by Torres-González (presented as Figure 2-4). The purpose of the background samples is to provide samples representative of the native soils that are collected in a similar soil strata to the RFI samples, not to demonstrate that the sample interval will be representative of the entire vertical cross-section. The soil sample depths for the background study (0 to 6 inches and 4 to 5 feet) have been selected to correspond to the same sample depths as the RFI samples.

2.2 Aerial Photograph Survey

A historical aerial photograph analysis conducted for AFWTF looked at aerial photographs dated 1936-37, 1959, 1962, 1964, 1967, 1970, 1985, and 1994. All of these photographs were evaluated for the Navy by a firm specializing in the analysis of aerial photography. The aerial photographic analysis were used to:

- Track the operational history of previously identified sites of known or suspected contamination
- Track the history of site operations from pre-Navy occupation (pre-WWII) to present



Base imagery is comprised of 1994 1-meter USGS Digital Ortho-imagery quarter quadrangles (DOQQs).

Scale in Meters
1000 0 1000 2000

SOIL LEGEND

Quaternary

Qa - Alluvial Deposits, Sand, Silt, Clay, Gravel Flood Plain, Terrace Deposits, and Piedmont Fan Deposits

Qb - Beach and Dune Desposits, Largely Calcite, Quartz and Volcanic Rocks, and Fragment Sand with Local Magnetite

Tertiary

Tl - Marine Sedimentary Rocks, Undivided

Cretaceous

Kv Sandstone, Siltstone, Conglomerate, Lava, Tuff,and Tuffaceous Breccia. Largely Desposited in Marine Environment. Extensive Deep Weathering. Some Limestone.

KTd- Plutonic Rocks, Largely Grandiorite,and Quartz Diorite, Locally Deeply Weathered

Aerial Photographic Analysis Findings

- SWMU, AOC, PI Sites
- 1994
- 1985
- 1970
- 1967
- 1964
- 1962
- 1959
- 1936-37

SYMBOL LEGEND

- Existing Water Supply Well to be Sampled as part of the Background Investigation
- Existing Background Well
- Existing Piezometer
- Existing TI Samples
- Existing Surface Soil Sample
- Existing Piezometer
- Proposed Background Well to be Installed
- Proposed Soil Sample

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FIGURE 2-4
Existing and Proposed Background Sample Locations
AFWTF, Vieques Island

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- Identify anomalies; e.g., ground scars, cleared areas, debris piles, and possible disposal areas

While anomalies may be attributed to a number of causes unrelated to environmental concerns, the locations of the background samples were selected away from all photo identified (PI) sites. The locations of the PI sites in relation to the proposed background samples are presented in Figure 2-4.

2.3 Sample Locations

The statistical analysis to be used to evaluate the background data assumes that the sampling is randomized. Randomization means that any location carries an equal probability of being sampled and that sample locations are randomly assigned. It is an insurance policy against potential bias in results to unknown processes. While randomization is an essential component to a sampling strategy, complete randomization is not necessarily the most efficient way to assign sample locations. A useful constraint to randomization in environmental situations where spatial coverage is of interest is to systematically sample from a randomized point. This means that all points in the area to be characterized carry equal probability of being sampled. Examples include gridding an area with randomized start-point and grid orientation. Application of this strategy in an area which is linear would consist of equispaced samples collected along a transect, with the first sample collected at a random start point.

Access to most of the island is limited because of the dense vegetation. Therefore, soil sampling locations were selected from a random location along a roadway and were equally spaced along the roadway. The samples will be collected away from the road in the vegetation, and away from mowed and maintained areas to prevent detection of potential contamination resulting from vehicular traffic along the roadways. Prior to sample collection, each sample location will be inspected in the field to ensure that the area represents a non-impacted area of the site.

The selection of groundwater sample locations was based on their location with respect to potential sources of groundwater contamination. This will be demonstrated by a comparison of the sites to be investigated, the existing groundwater elevation contours, and the proposed well locations to be sampled, which show that the wells are not located downgradient from any potential source areas. Sampling locations will be verified in the field for access considerations, as well as to verify that the selected areas have not been impacted by Navy operations. Samples will not be collected from areas of known contamination, nor will samples be collected from areas identified as IR sites.

2.3.1 Groundwater Sampling Locations and Analysis

Background data for metals in groundwater will be obtained from collection of groundwater samples from three existing piezometers, one existing water supply well, and three newly installed monitoring wells. To supplement the background groundwater data, analytical data obtained from groundwater samples collected in 1999 from 11 background monitoring wells installed along the western perimeter of the AFWTF will also be used. All samples will be analyzed for appendix IX metals.

Boring and well constructions have been reviewed as part of this Work Plan development. All background wells are screened in the water table aquifer and are appropriate for use in establishing background water quality of the surficial aquifer. The location of the existing and proposed groundwater sampling locations for the background investigation are shown in Figure 2-4.

While there is only one groundwater aquifer at the site, the well locations are representative of each soil type. The groundwater data will be evaluated for potential differences in the inorganic chemical concentrations between wells finished in different soil types. Statistical analyses will be conducted to determine if the ground water analyses can be grouped together as a single data set or if the analyses will be grouped together by the strata in which the well screens are installed. Statistical results, dissolved versus total metals concentration, and the general chemistry parameters of the groundwater will be used to determine a set of background values for comparison with site groundwater concentrations.

2.3.2 Soil Sampling Locations

To establish background soil quality, non-impacted areas that represent the underlying geologic and hydrogeologic conditions were identified for background sampling locations, as discussed in Section 2.1. Thirty-three background surface soil analysis (0 to 6 inches below land surface [bls]) will be obtained as part of this background study. In addition, co-located subsurface vadose-zone soil samples (4 to 5 feet bls) will be collected at 22 of the proposed background soil sample locations. These samples will be analyzed for appendix IX metals.

Eleven background surface soil samples were collected in 1999 along the western perimeter of AFWTF during the installation of the background monitoring wells. Three of the surface soil samples were collected in Kv deposits, six in KTd deposits, and two in Qa deposits. These samples were analyzed for appendix IX metals. These data will be used to supplement the background investigation. The locations of the existing and proposed background soil samples are shown on Figure 2-4.

SECTION 3

Statistical Analysis

Background sampling data will be evaluated following EPA guidance: "*Geostatistical Sampling and Evaluation Guidance for Soil and Solid Media,*" Review draft, U.S. EPA, February 1996, and "*Statistical Analysis of Ground-water Monitoring Data at RCRA Facilities,*" Addendum to Interim Final Guidance, Office of Solid Waste, USEPA, June 1992. Using this guidance, differences in chemical concentrations between soil types will be determined. If the statistical results indicate that data can be combined, a single data set will be developed for each medium, where appropriate. A description of tests conducted, results, and conclusions will be presented in the background data analysis report.

3.1 Analyzing Data and Statistical Testing

The following subsections provide a brief overview of analytical methods for identifying data gaps, combining or pooling data sets, developing descriptive summary statistics, evaluating outliers, handling non-detect data, and evaluating censored data, and establishing goodness-of-fit tests.

3.1.1 Evaluation of Outliers

Data analysis and statistical testing will be confounded by the presence of outliers in both site and background data sets. Outliers are extreme high or low measurements that are sometimes referred to as "spurious" data because they are highly divergent from the main population of data. Outliers may arise from matrix interferences or errors in transcription, sampling technique, datacoding, analytical methods, or instrument calibration. Alternatively, what may appear to be outliers may simply represent inherent variability in the regional background geochemistry. This will be particularly true for background areas in which the geochemistry is heterogeneous. Apparent outliers may also represent hot spots in site data sets. When outliers are not identified and removed from data sets, they can disproportionately affect the statistical descriptors of the data set. That is, the mean can be biased toward the direction of the outlier(s) and artificially increase data variability and standard deviation. Ultimately, outliers can lead to flawed statistical testing and erroneous conclusions about background conditions. Therefore, it is important to identify outliers in both background and site data sets and eliminate them before conducting further statistical analysis.

Outliers will be identified by visually inspecting graphical representations of the data set. Box and whisker plots, scattergrams, and ranked data plots may be used to identifying data that are much higher or lower than the main data set population. When potential outliers are identified through the use of one or more graphical techniques, a statistical test will be conducted to confirm that the data are outliers. It is important to emphasize that no datum will be discarded as an outlier based solely on the results of one of these statistical tests. The possibility always exists that the suspected outlier is an accurate measurement. Before the outlier is deleted from the data set, one of the above four statistical analyses will be performed on both the original data set containing potential outliers and the truncated data set minus the outlier.

3.1.2 Establishing Probability Density Functions With Goodness-of-Fit Tests

Probability Density Functions (PDFs) are used to graphically model the data distribution. Common PDFs used to model environmental data include normal, lognormal, and Weibull distributions. Determining the PDF that best fits a particular data set is important for selecting the statistical test best suited for the data set to provide optimal statistical performance. One of the most important characteristics of a data set is the underlying distribution of the data. For example, Student's t-test may be quite useful for testing data that are distributed normally or lognormally. Student's t-test may not provide the needed statistical power, however, to determine differences between site and background populations if the underlying distributions are not normal. Hence, conducting a goodness-of-fit test to determine the best statistical test will be useful to determine whether site and background data sets are significantly different.

Two of the most important distributions for tests involving environmental data are the normal distribution and the lognormal distribution. Non-parametric tests will be used for data sets that do not follow either of these two PDFs.

3.1.3 Non-Detect Data Sets

The most common techniques used to derive proxy values for non-detect data sets involve deletion and substitution techniques. EPA has developed general guidelines for these procedures based on the number of non-detected data in the data set. The analytical approaches include: (1) replace non-detects with one-half the SQL (not the CRQL), (2) Cohen's Adjustment, Trimmed Mean, Winsorized Mean and standard deviation, (3) and the test for proportions.

Although choosing the most applicable approach is primarily based on the percentage of non-detects, professional judgment will also be applied. For example, in addition to percentage of non-detects, the number of data in the data set should be a factor in the decision. A data set where 1 sample out of 4 is not detected should be treated differently from a data set where 25 out of 100 samples are not detected.

3.1.4 Evaluating Censored Data

Selecting the appropriate statistical method requires matching the strengths and weaknesses of the statistical method with the data set under investigation. In other words, data should not be "force fit" into an inappropriate test or inappropriately manipulated to fit the requirements of the statistical method. To conduct statistically robust background comparisons, matching the correct statistical method with a data set is a critical first step. Figure 3-1 presents the decision-making flow chart that integrates data analysis and statistical testing.

The statistical methods in the tool box include two parametric tests. (Student's "two-sample" t-test and Satterthwaites's t-test) and two non-parametric tests (Wilcoxon rank sum test and Gehan's test). In addition, the non-parametric Quantile test is included to identify sites with pockets of elevated concentrations. These statistical methods, in conjunction with graphical analyses, provide a wide range of application.

The appropriate statistical test is selected based on how much information is available about the site and background PDFs, frequency of detection, and sample size of the data set. As shown in Figure 3-1, the Student's t-test is a parametric statistical test that may be used to detect differences in the background and site means when both background and site data sets follow a normal PDF, have a frequency of detection of 100 percent, and have equal variances. Many environmental data sets are lognormally distributed, which requires natural log transformation of the data before computing statistical tests. Satterthwaites's t-test, which is also a parametric test, may be used to detect differences in means when both data sets follow a normal distribution.

For data sets that follow a normal PDF but for which the frequency of detection is significantly less than 100 percent or for which the data set has multiple detection limits (for non-detect samples), non-parametric tests may be used because they are better able to handle the non-detects and are expected to provide greater statistical power.

Non-parametric statistical tests may also be used for data sets that do not follow a normal PDF. When there is a single detection limit (for non-detect samples), the Wilcoxon rank sum (WRS) test should be used. For non-normal data sets with multiple detection limits, the Gehan test should be used. For data sets that follow a lognormal distribution, either the non-parametric tests or the t-test computed on the natural logarithms of the data may be used.

3.2 Incorporating Background Analytical Results into Remedial Investigations and Feasibility Studies

One of the most important uses of background analyses is for identifying COCs associated with Navy releases. EPA risk assessment guidance (EPA, 1989) provides procedures for dealing with naturally occurring background chemicals in the human health risk assessment, stating that:

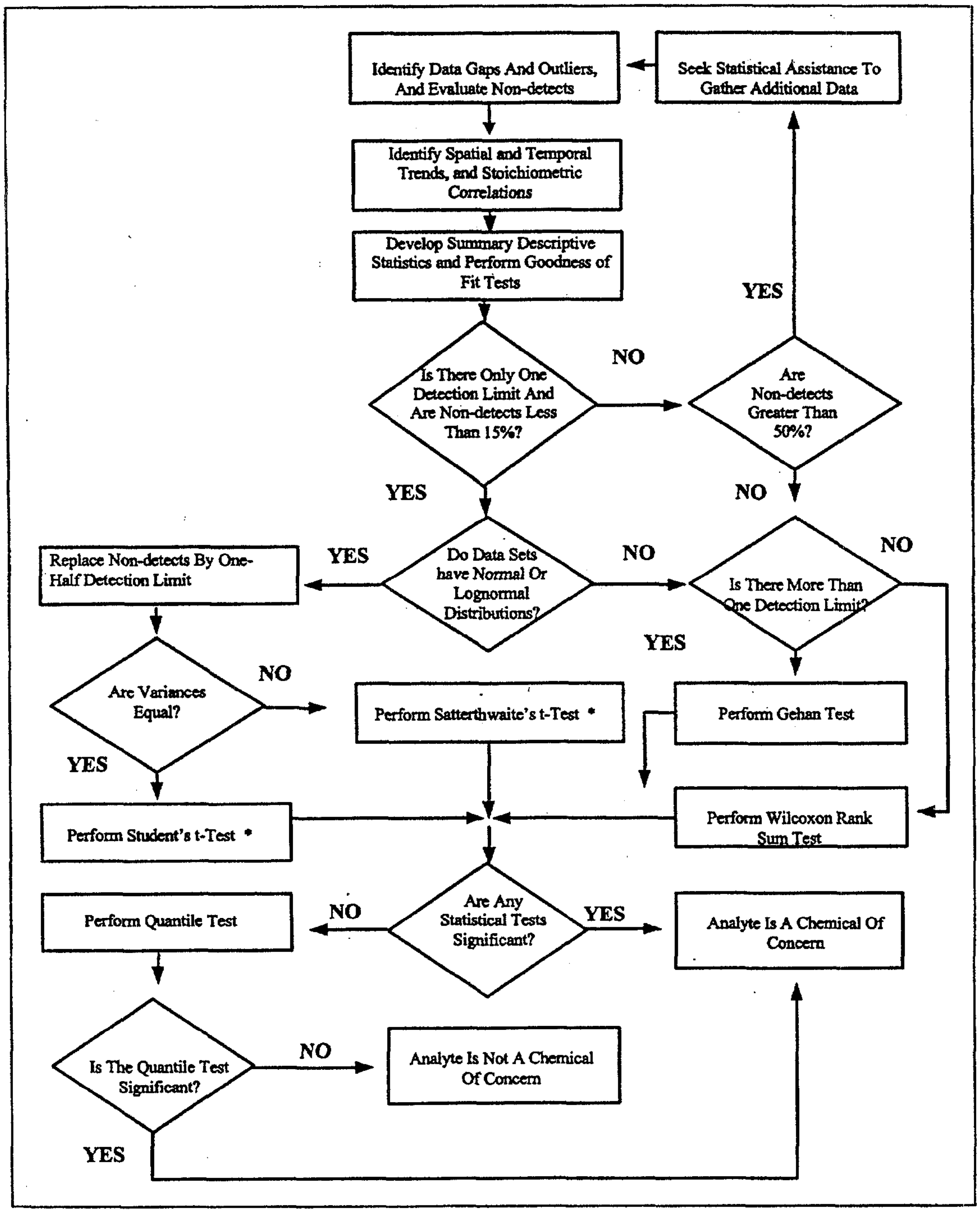
> "If inorganic chemicals are present at the site at naturally occurring levels, they may be eliminated from the quantitative risk assessment."

While the cumulative risk associated with background and site release may exceed an acceptable risk level (triggering remediation), when evaluated separately the site release may pose insignificant risks. In this case, cleanup would be unwarranted.

According to EPA, establishing background conditions is an integral part of the HHRA (EPA, 1989). EPA emphasizes that how background information and risks are presented in a risk assessment is a key component of describing overall site-related risk:

> "At a minimum, the discussion should include confidence that the key site-related contaminants were identified and discussion of contaminant concentrations relative to background concentration ranges."

FIGURE 3-1
ANALYZE SITE AND BACKGROUND DATA AND CONDUCT STATISTICAL TESTS



* If the data are lognormally distributed then the t-test and satterthwaite's t-test are conducted on the natural logarithms of the data

Source: Procedural Guidance for Statistically Analyzing Background Data.
U.S. Navy NAVFACENGCOM, September 1998.

Background analyses will be conducted prior to identifying COCs associated with site releases. When the background analyses indicate that site-specific and naturally occurring background chemical concentration populations are not statistically different, the chemical will be eliminated as a COC and not evaluated in the risk assessment.

SECTION 4

Technical Approach and Investigation Procedures

This section details the technical approach developed to perform the sampling activities for the background investigation. The tasks to be implemented for the background investigation include: project planning and existing data review, field investigation, sample analysis and validation, statistical data evaluation, and preparation of a Background Investigation Report. Procedures to be implemented will be addressed in site-specific project plans. To simplify the process of developing site specific project plans, a Master Work Plan (WP), Master Field Sampling Plan (FSP), Master Quality Assurance Project Plan (QAPP), Master Investigation-Derived Waste Plan (IDWP), and Master Health and Safety Plan (HASP) have been prepared for IR program activities to be performed at AFWTF Vieques. The Master Project Plans provide the details for sampling and analysis protocols to be followed and general types of activities to be accomplished for implementation of field activities at AFWTF Vieques. Preparation of site-specific plans is simplified through reference to the Master Plan documents.

4.1 Field Investigation

This task involves efforts related to fieldwork support, the field investigation, and surveying.

4.1.1 Fieldwork Support

Fieldwork support includes subcontractor procurement, mobilization, and utility clearance, as described in the following subsections.

4.1.1.1 Subcontractor Procurement

As part of the initial field mobilization to AFWTF, CH2M HILL will procure surveying, drilling of soil borings, monitoring well installations, analytical laboratory, and data validation services for work at the Base. The subcontracted analytical laboratory will meet Naval Facilities Engineering Support Command (NFESC) Level D quality control.

4.1.1.2 Mobilization/Demobilization

Mobilization includes procurement of necessary field equipment, and initial transport to the site. Equipment and supplies will be brought to the site when the CH2M HILL field team mobilizes for field activities.

Demobilization activities include time for IDW sampling and general site restoration prior to the return transport of field equipment and crew. IDW generated during field activities will be containerized in 55-gallon drums. Equipment decontamination fluids will be containerized in 55-gallon drums for storage. The 55-gallon drums will be properly labeled and stored at a location designated by LANTDIV and AFWTF prior to disposal.

All IDW generated will be analyzed to determine if it is hazardous or non-hazardous. The IDW will be disposed of in the appropriate manner dictated by the results of the analysis. It is anticipated that the IDW generated will be non-hazardous waste.

4.1.1.3 Utility Clearance

Utility clearances will be performed prior to the start of any subsurface investigation activities at the site. CH2M HILL will coordinate subsurface utility clearances with Public Works Center (PWC) at AFWTF. CH2M HILL will be responsible for insuring that all appropriate contacts have been made with AFWTF personnel and that clearances have been given for proposed subsurface sampling locations, including marking of utilities near the areas of proposed subsurface sampling locations, prior to the initiation of field operations.

4.1.2 Field Sampling Activities

This section describes the field activities to be conducted for the background study. The background investigation consists of the collection and analysis of:

- Six groundwater samples from two existing piezometers, one existing water supply well, and three newly installed background wells
- Fifty-five soil samples, including 33 surface soil and 22 subsurface soil samples

Table 4-1 presents the number of samples to be collected for establishing background conditions and methods of analysis. Quality Assurance/Quality Control (QA/QC) samples are also identified in the table, and are discussed in greater detail in subsequent sections.

Details regarding the required containers, preservatives, and holding times for groundwater and soil samples are presented in Section 2 of the Master Field Sampling Plan. Table 4-2 summarizes sample containers, preservatives, and holding times to be used for the background investigation.

4.1.2.1 Soil Sampling Procedures

The background investigation involves the collection of co-located surface and subsurface soil samples. Surface soil samples will be collected using a stainless steel trowel and stainless steel mixing bowl. Surface soils will be collected from the surface to a depth of 6 inches bls. A stainless steel hand auger will be employed for collecting the subsurface soil samples. Subsurface samples will be collected from a depth of 4 to 5 feet bls. The applicable Standard Operating Procedures (SOPs) for the collection of soil samples are located in the Master Work Plan (MWP).

4.1.2.2 Groundwater Sampling Techniques

Groundwater samples will be collected using low flow purging and sampling techniques. It is anticipated that a submersible Redi-Flow pump or peristaltic pump will be used for groundwater sampling, depending on the depth to groundwater. The peristaltic pump will be the preferred method. If the depth to water is greater than 20 feet, however, the submersible pump must be used. The applicable SOPs for the collection of groundwater samples are located in the MWP.

TABLE 4-1
Background Investigation Samples
AFWTF, Vieques, Puerto Rico

Parameter	Method	No. of Samples	Equipment Rinseate Blanks	Field Blank	Field Duplicate	Matrix Spike	Matrix Spike Duplicate	Total Number of Samples
Groundwater Samples								
Appendix IX Metals	SW-846 6010B & 7000 Series	6	1	1	1	1	1	11
Soil Samples								
Appendix IX Metals	SW-846 6010B & 7000 Series	55	4	0	6	3	3	71

Notes:
Appendix IX Inorganic Compounds, SW-846 Methods
Assumptions regarding rate of sample collection:
1. One day is required to collect groundwater samples
2. Four days are required to collect soil samples
Equipment Rinseate blanks – one per matrix per day; blank for filtered samples is a filtration blank.
Field Blanks one field blank per sampling event will be collected.
Field Duplicates – one per every ten samples per matrix/medium.
Matrix Spike/Matrix Spike Duplicates – One per 20 samples per matrix.

TABLE 4-2
Required Containers, Preservatives, and Holding Times for Soil and Groundwater Background Investigation Samples
AFWTF, Vieques, Puerto Rico

Parameter	Method	No. of Sample Containers	Sample Containers	Preservative	Holding Time	Volume of Sample Collected
Groundwater Samples						
Appendix IX Metals	SW-846 6010B & 7000 Series	1	1- liter polyethylene bottle	HNO_3 to pH < 2, Cool to 4°C	6 months, 28 days for Hg	Fill to shoulder
Soil Samples						
Appendix IX Metals	SW-846 6010B & 7000 Series	1	4 oz. glass jar with teflon cap	Cool to 4°C	6 months, 28 days for Hg	Fill completely

4.1.3 Sampling Equipment Decontamination

All non-disposable sampling equipment will be decontaminated immediately after each use. The applicable SOPs for the decontamination of personnel and equipment are presented in Volume 2 of the Master Project Plans and are included with the FSP checklist.

4.1.4 Surveying

Sampling locations of each background soil sample will be horizontally located using a global positioning system (GPS) following field activities. All survey data will be expressed as North American Datum (NAD) 83 coordinates from x and y directions and in terms of National Geodetic Vertical Datum (NGVD) for the z direction (monitoring wells only).

4.1.5 Sample Designation

Sampling locations and sampled media collected during the background investigation will be assigned unique designations to allow the sampling information and analytical data to be entered into a Geographic Information System (GIS) data management system to be developed for AFWTF. The following sections describe the sample designation specifications.

4.1.5.1 Specifications for Field Location Data

Field station data consists of information assigned to a physical location in the field where a sample is collected. For example, a soil boring that has been installed will require a name that will uniquely identify it with respect to other soil boring locations, or other types of sampling locations. The station name provides for a key in the database to which any samples collected from that location can be linked to form a relational database.

A listing of the location identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all field activities. Each station will be designated by an alphanumeric code that will identify the station location by facility, site type, site number, location type, and sequential location number. The scheme that will be used to identify field station data is documented in Section 3 of the Master Field Sampling Plan, and is summarized in Table 4-3.

4.1.5.2 Specifications for Analytical Data

Analytical data will be generated through sampling of various media at AFWTF. Each analytical sample collected will be assigned a unique sample identifier. The scheme used as a guide for labeling analytical samples in the field is documented below. The format that will be used for electronic deliverables from the analytical laboratory and the data validator is documented below.

4.1.5.3 Sample Identification Scheme

A standardized numbering system will be used to identify all samples collected during water, soil, and sediment sampling activities. The numbering system will provide a tracking procedure to ensure accurate data retrieval of all samples taken. A listing of the sample identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all sampling activities.

TABLE 4-3
Field Station Scheme

First Segment	Second Segment	
Facility, Station Type, Site Number	**Station Type**	**Station Number, Qualifier**
AAANNN	**AA**	**NNNA**
Facility: CG = Camp Garcia, AFWTF, EMA Station Type: S = Site O = Operable Unit U = UST A = AOC BG = Background Site Number: Qa = Alluvial deposits Qb = Beach and Dune Deposits Tl = Marine Sedimentary Rock Deposits KTd = Plutonic Rocks Deposits Kv = Sandstone, Siltstone, Conglomerate, Lava, Tuff, and Tuffaceous Breccia Deposits.	Station Type: SB = Subsurface Soil Sample Location SS = Surface Soil Sample Location GW = Groundwater Sample Location Station Number: Sequential Station Number Qualifier: S = Shallow D = Deep K = Background	

Notes:
"A" = alphabetic
"N" = numeric

Sample identification for all samples collected during the investigations will use the following format.

Each sample will be designated by an alphanumeric code that will identify the facility, site, matrix sampled, and contain a sequential sample number. QA/QC samples will have a unique sample designation. Table 4-4 documents the general guide for sample identification. If one qualifier is pertinent to the sample ID but another is not, only the Table 4-3 applicable qualifiers will be used. A non-utilized character space does not have to be maintained.

4.1.5.4 Electronic Deliverable File Format

An offsite laboratory will analyze the supplemental background investigation samples and tabulate the results in an electronic format specified by CH2M HILL. The data validator will add data validation qualifiers to the table of analytical results. In addition to hard copy data package deliverable, CH2M HILL will receive an electronic file from the data validator in a table format that will facilitate downloading into a database. Table 4-5 indicates the format that will be used for electronic deliverables.

TABLE 4-4
Sample Designation Scheme

First Segment	Second Segment		Third Segment
Facility, Station, and Site Number	Sample Type	Sample Location + Sample Qualifier	Additional Qualifiers (sample depth, sampling round, etc.)
AAANN	AA	NNNA or NNAA	ANN or NNNN

Facility:

CG = Camp Garcia, AFWTF, EMA

Station Type:

S = Site

W = SWMU

O = Operable Unit

U = UST

A = AOC

BK = Background

Site Number:

BG = Background

Qa = Alluvial deposits

Qb = Beach and Dune Deposits

Tl = Marine Sedimentary Rock Deposits

KTd = Plutonic Rocks Deposits

Kv = Sandstone, Siltstone, Conglomerate, Lava, Tuff, and Tuffaceous Breccia Deposits.

Sample Type:

DS = Direct Push – Soil

DW = Direct Push – Water

SS = Surface Soil

TB = Trip Blank

EB = Equipment Blank

FB = Field Blank

FD = Field Duplicate

Sample Location:

1. Station Samples (NNA)

NNA - refers to sequential station number

NNA - letter qualifier for Deep, Shallow, or Composite, sample (if applicable).

2. QC Samples (NNN)

NNN - numbered sequentially for each type of blank (i.e., 1, 2, etc.) collected for that day's sampling

NNN - refers to month of sampling event

Sample Qualifiers:

F = filtered sample

P = duplicate sample

K = background sample

Additional Qualifiers:

1. Monitoring Well Groundwater Sample (refers to sampling round for that well):

R01 - Round 1

R02 - Round 2

R03 - Round 3

2. Direct Push Subsurface Sample (refers to depth of sample):

Enter depth of top of sample interval

3. QC Samples

NNNN - refers to day and year of sampling event

Notes:
"A" = alphabetic
"N" = numeric

TABLE 4-5
Analytical Data Electronic Deliverable

Analytical data must be delivered in a format compatible with Microsoft Access 2.0 or 7.0

Field Name	Field Type	Description
Sample_ID	A20	The CH2M HILL sample ID (taken from the Chain of Custody).
Sample_Analysis	A5	The analysis performed on the sample. We classify our samples into six main groups: VOA, SVOA, INORG, PEST, WCHEM, and FMETAL (for filtered samples).
Date_Analyzed	D	The date the sample was analyzed.
Date_Received	D	The date the sample was received in the lab.
Date_Collected	D	The date the sample was collected.
Lab_Sample_ID	A15	The lab sample ID.
Dilution_Factor	N	The dilution factor used, if applicable.
SDG_Number	A6	The SDG number.
CAS_Number	A6-A2-A1	CAS Number of the compound being analyzed (Note that the CAS number must consist of three number segments of defined length, separated by dashes).
Chem_Name	A50	The compound being analyzed.
Ana_Value	N	The analytical result.
Std_Qual	A5	The lab qualifiers, if any (e.g., U, UJ, B).
DV_Qual	A5	The data validation qualifier (e.g., J, R).
Units	A10	The unit of the result (e.g., MG/L).
Detect_Limit	N	The detection limit for the compound.
Method	A15	Analytical method used to analyze the sample fraction.

4.2 Sample Analysis and Validation

This task involves efforts related to the sample management and data validation. CH2M HILL will be responsible for tracking sample analysis and obtaining results from the laboratory. The analytical data generated during the AOC investigation field program will be validated by an independent data validation subcontractor according to EPA's *Functional Guidelines for Data Validation* (EPA, October, 1999).

4.2.1 Sample Analysis

All analyses of soil and groundwater will be conducted at a contracted laboratory that fulfills all requirements of the U.S. Navy's QA/QC Program Manual and EPA's SW 846 methods. The laboratory must follow the scope of work prepared by the project team. A signed certificate of analysis will be provided with each laboratory data package, along with a certificate of compliance certifying that all work was performed in accordance with the Contract Laboratory Program (CLP) SOW. All analyses will be performed following the highest level of Navy guidance. Analyses will include the proper ratio of field QC samples recommended by NFESC guidance for the DQOs.

This task includes checking the data from the laboratory and converting it into an electronic format that can be readily incorporated into the GIS Data Management system for AFWTF.

4.2.1.1 Field Quality Control Procedures

Quality control duplicate samples and blanks are used to provide a measure of the internal consistency of the samples and to provide an estimate of the components of variance and the bias in the analytical process. The QAPP provides details with regard to the number and frequency of field QC samples to be collected during the investigation.

4.2.1.2 Blanks

Blanks provide a measure of cross-contamination sources, decontamination efficiency, and other potential errors that can be introduced from sources other than the sample. ASTM Type II water will be used for blanks. Four types of blanks can be generated during sampling activities: trip blanks, field blanks, equipment rinseate blanks, and temperature blanks.

VOCs are not anticipated to be collected as part of this background sampling event. Therefore, there will be no trip blank for this background sampling event.

One field blank will be collected per sampling event. If sampling events extend beyond 1 week (5 working days) or for windy and dusty field conditions, the number of field blanks should be increased. Field blanks are used to determine the chemical quality of water used for such procedures as decontamination and blank collection.

One equipment blank per sample medium will be obtained for each day of sampling. Equipment blanks will give an indication of the efficiency of decontamination procedures.

One temperature blank will be included in each cooler.

4.2.1.3 Duplicates

Duplicate soil samples will be placed in a stainless steel bowl and thoroughly mixed before placement in appropriate sample containers. The samples will initially be stirred in a circular fashion in one direction until thoroughly mixed. The sample will be turned over in the bowl and subsequently stirred in a circular fashion in the opposite direction until thoroughly mixed. These procedures will be continued to ensure that all parts of the sample are mixed and that the sample is as homogeneous as possible before splitting the samples and placing in the appropriate sample containers.

4.2.1.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD samples will be collected at a frequency of one MS/MSB for every 20 field samples collected. Analytical results of these samples indicate the impact of the matrix (water, soil, sediment) on extracting the analyte for analysis. MS/MSD samples give an indication of the laboratory's analytical accuracy and precision within the sample matrix. Data validators will use these results to evaluate the accuracy of the analytical data.

4.2.2 Data Validation

Analytical results will be validated by CH2M HILL subcontractors approved by the Navy. Data validators will use EPA Region II guidance (EPA, September 1994a).

The hardcopy data packages will be reviewed by the subcontractor chemists using the process outlined in *Functional Guidelines for Evaluating Data* (EPA, 1994). Areas of review included (when applicable to the method) holding time compliance, calibration verification, blank results, matrix spike precision and accuracy, method accuracy as demonstrated by laboratory confirmation samples (LCSs), field duplicate results, surrogate recoveries, internal standard performance, and interference checks. A data review worksheet will be completed for each data package. Any non-conformance will be documented. This data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decision-making processes.

Data that are not within the acceptance limits will be appended with a qualifying flag, which consists of a single or double-letter abbreviation that reflects a problem with the data. The following flags will be used in the evaluation:

U - Undetected. Analyte was analyzed for but not detected above the method detection limit (MDL).

UJ - Detection limit estimated. Analyte was analyzed for, and qualified as not detected. The result is estimated.

J - Estimated. The analyte was present, but the reported value may not be accurate or precise.

R - Rejected. The data are unusable. (NOTE: Analyte/compound may or may not be present.)

Numerical sample results that are greater than the MDL but less than the laboratory reporting limit (RL) are qualified with a "J" for estimated as required by *Functional Guidelines for Evaluating Data* (EPA, 1994).

4.3 Data Quality Evaluation

Analytical data will be collected during this investigation in the form of laboratory analytical results and the database will be populated with data validation qualifier results.

The data quality evaluation (DQE) is the quantitative and qualitative evaluation of overall trends in the project-specific database. The objective of the DQE process is to understand the effects of the overall analytical process on data usability to support project-specific DQOs. The DQE includes an analysis of the effect of the specific sample matrix on the overall analytical process.

The DQE deliverable is a DQE Technical Memorandum (TM) that can be used by the project team to readily understand project-specific data usability. Topics to be addressed in the DQE TM include the following:

- *Potential blank contamination*—the effect on the usability of data for compounds detected in both the field or laboratory blank samples and the corresponding field samples
- *Laboratory performance*—evaluation of the recovery for blank spike samples such as the LCS, calibration criteria, etc.
- *Potential matrix interferences*—evaluation of the accuracy and precision for surrogates, spiked field samples, and duplicate field sample results
- *Assessment of PARCCs*—comparison of DV findings with PARCCs (precision, accuracy, representativeness, comparability, and completeness)

This task also includes the evaluation of validated laboratory data and field-generated data. The data evaluation will include incorporation of historical data from the previous investigations, tabulation of the data, and generation of figures and/or tables associated with data (e.g., sampling location maps).

4.4 Investigation Reports

A Draft Background Study Report will be prepared for submittal to EPA, LANTDIV, NSRR, and PREQB. Based on the evaluation of the results presented in the Draft Report, a Final Report will be prepared.

SECTION 5

Project Management and Staffing

The CH2M HILL Task Manager designated for the oversight of this project is Mr. Marty Clasen. Mr. Clasen will be supported by Mr. John Tomik, who serves as Activity Manager for Vieques Island. Mr. Clasen will be responsible for such activities as technical support and oversight, budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, and coordination with LANTDIV, NSRR, and subcontractors.

The background investigation field program (soil and groundwater sampling) will be performed by qualified CH2M HILL staff members. CH2M HILL will notify LANTDIV and NSRR which CH2M HILL personnel will mobilize to the site prior to initiating field activities.

The Navy Technical Representative (NTR) is Mr. Chris Penny. Mr. Penny is the LANTDIV representative and provides technical direction on the project and coordinates funding and overall interaction with other agencies and interested parties. Mr. Penny can be contacted at the address and phone number listed below.

Ms. Madeline Rivera Ruiz is the IR Program Coordinator for U.S. Naval Station, Roosevelt Roads. Ms. Ruiz is responsible for the coordination of all Naval environmental activities at Roosevelt Roads and Vieques Island. Ms. Ruiz can be contacted at the address and phone number listed below.

Mr. Chris Penny
Remedial Project Manager
Installation Restoration Section
Environmental Programs Branch
Environmental Division
Atlantic Division (LANTDIV) Code 1822
Naval Facilities Engineering Command
1510 Gilbert Street
Norfolk, VA 23511-2699
(757) 322-4815

Ms. Madeline Rivera Ruiz
U.S. Naval Station Roosevelt Roads
Environmental Engineering Division
Public Works Department, Bldg. 31
Ceiba, Puerto Rico 00735
(787) 865-5337

SECTION 6

Contractual Services

This section documents the anticipated subcontract services required for the completion of tasks documented in this work plan. The background investigations will require subcontract services from the following:

- Hollow Stem Auger and Air Rotary Drilling
- Analytical Laboratory
- Data Validation
- Surveying

The names of the subcontractors will not be identified until the subcontracted procurements are bid. However, EPA will be provided the qualifications of the selected subcontractor to demonstrate that the contractor can meet the data quality objectives.

SECTION 7

Project Schedule

This section documents the project schedule and the due dates of deliverables. Table 7-1 shows a breakdown on primary deliverables and assumed intervals for governmental review. Longer periods of review will result in an extended schedule.

TABLE 7-1
Proposed Project Milestones

AFWTF Background Study

Key Project Milestones	Days Duration
Notice to Proceed	0
Submit Draft Background Investigation Work Plan	0
Navy, EPA and PREQB Review of Draft Work Plan	30
Meeting with Navy, EPA, and PREQB	1
Prepare Final Work Plan	7
Submit Final Work Plan	0
Procure Subcontractors/Mobilize	15
Conduct Field Investigation	14
Laboratory Analyses	60
Data Validation/Management	30
Data Evaluation	15
Prepare Draft Reports	30
Submit Draft Reports	0
Navy, EPA and PREQB Review of Draft Reports	30
Prepare Final Reports	15
Submit Final Reports	0

SECTION 8

References

EPA, 1994. *EPA's Functional Guidelines for Data Validation.*

EPA, 1994a. September 1994. *Guidance for the Data Quality Objectives Process.* EPA QA/G-4. Office of Research and Development. EPA/600/R-96/055.

EPA, 1995. December 1995. *Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites.* Technology Innovation Office, Office of soil Waste and Emergency Response, EPA/540/S-96/500.

EPA, 1998. Statistical Tests for Background Comparison at Hazardous Waste Sites.

EPA, 1989. December 1989. *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A) [HHEM], Interim Final.* EPA/540/1-89/002. Office of Emergency and Remedial Response.

NAVFACENGCOM, 1998. *Procedural Guidance for Statistically Analyzing Environmental Background Data.*

NAVFACENGCOM, 1999. *Handbook for Statistical Analysis of Environmental Background Data.*

APPENDIX A

Checklists

Site-Specific Investigation-Derived Waste Plan Checklist

This checklist supplements the Master IDW Plan with site-specific information. Once completed for a specific project, it provides necessary IDW information for each investigation. It is to be taken into the field with the Master IDW Plan.

Site: AFWTF

1. IDW Media:
   - X_____Soil cuttings
   - X_____Well development or purge water
   - X_____Decontamination residual soil and wastewater
   - X_____Personal Protective Equipment (PPE) or disposable equipment
   - ______Other ______

2. Expected Regulatory Status:
   - ______Hazardous
   - ______Solid Waste
   - X_____Unknown
   - X_____Other Waste management activities regulated by OSHA Hazwoper standard (1910.120)

3. Site Location: Decontamination fluids and PPE will be generated at all SWMUs.

4. Nature of Contaminants Expected:
   - ______Petroleum contamination
   - ______Polyaromatic hydrocarbon
   - ______Pesticides
   - ______Herbicides
   - ______PCBs
   - ______Metals
   - ______Other - Contaminant concentrations from previous analytical results were very low for all of the above.

6. Volume of IDW Expected:
   - X____ Drums - Maximum of six. One for decontamination

     Fluids, four for drilling cuttings, and one for PPE and other disposable items.
   - ______Cubic Yards
   - ______Tons
   - 330____Gallons

6. Compositing Strategy for Sample Collection: No IDW sampling planned. Will base disposal decisions on analytical results from sampling.

7. IDW Storage

X_____As per Master IDW Plan ______Other________________________________

8. Waste Disposal

X_____As per Master IDW Plan ______Other________________________________

Site-Specific Field Sampling Plan Checklist

This checklist supplements the Master FSP with site-specific information. Once completed for a specific project, it provides necessary field sampling information for each investigation. It is to be taken into the field with the Master FSP.

Site: AFWTF

1. Tasks to be performed:

   ______Geophysical surveys
   ______Soil gas surveys
   ______Surface water and sediment sampling
   X______Surface soil sampling
   X______Soil boring installation
   ______Subsurface soil sampling
   X______Monitoring well installation and development
   ______Monitoring well abandonment
   X______Groundwater sampling
   X______In-situ groundwater sampling
   ______Aquifer testing
   X______Hydrogeologic measurements
   ______Biota sampling
   ______Trenching
   ______Land surveying
   X______Investigation derived waste sampling
   X______Decontamination
   ______Other______________________

2. Field measurements to be taken:

   X______temperature
   X______pH
   ______dissolved oxygen
   X______turbidity
   X______specific conductance
   X______organic vapor monitoring
   X______geophysical parameters (list):
   X______electromagnetic induction
   ______ground-penetrating radar
   X______surveying
   ______magnetometry
   X______global positioning system
   ______soil gas parameters (list):
   ______combustible gases
   X______water-level measurements
   X______pumping rate
   ______other______________________

3. Sampling program (nomenclature, etc.):

   X______As per Master FSP ______Other
   Investigation Workplan

4. Map of boring and sampling locations (attach to checklist): See Workplan.

5. Table of field samples to be collected: See Investigation Workplan.

6. Applicable SOPs or references to specific pages in Master FSP: The following SOPs from Volume 2 of the Master Project Plans are to be implemented.

   - Shallow Soil Sampling
   - Monitoring Well Installation
   - Homogenization of Soil and Sediment Samples

- Chain-of-Custody
- Packaging and Shipping Procedures
- Field Rinse Blank Preparation
- Decontamination of Personnel and Equipment
- Disposal of Fluids and Solids

7. Site-specific procedures or updates to protocols established in the Master FSP:

Described in the Workplan.

Site-Specific Quality Assurance Project Plan Checklist

This checklist supplements the Master QAPP with site-specific information. Once completed for a specific project, it provides necessary quality assurance information for each investigation. It is to be taken into the field with the Master QAPP.

Site: AFWTF

1. List sampling tasks: groundwater and subsurface soil sampling, surface soil sampling, and monitoring well installations.

2. List data quality objectives: The objective of the Background Investigation is to determine the background concentrations of naturally occurring metals.

3. Organization:

LANTDIV Navy Technical Representative	Chris Penny / LANTDIV
PREQB Federal Facilities Project Manager	Aissa Colon / PREQB
CH2M HILL Activity Manager	John Tomik / CH2M HILL
Quality Control Senior Review	Kevin Sanders / CH2M HILL
Technical Project Manager	Marty Clasen/ CH2M HILL
Field Team Leader	Eric Isern / CH2M HILL

4. Table of samples with analyses to be performed and associated QC samples included in the SWMU Investigation Workplan.

5. Analytical Quantitation Limits:

   X_____As per Master QAPP

   ______Other

6. QA/QC Acceptance Criteria (e.g., precision, accuracy)

   X_____As per Master QAPP ______Other (attached)

7. Data reduction, validation, and reporting:

   X_____As per Master QAPP ______Other (attached)

8. Internal QC Procedures (field and laboratory):

   X_____As per Master QAPP ______Other (attached)

9. Corrective Action:

   X_____As per Master QAPP ______Other (attached)

10. Other deviations from Master QAPP - None

Site-Specific Health and Safety Plan

This checklist must be used in conjunction with the Master HASP. This checklist is intended for use by CH2M HILL employees only. All CH2M HILL employees performing tasks under this checklist must read and sign both this checklist and the Master HASP and agree to abide by their provisions (see EMPLOYEE SIGNOFF attached to the checklist.

Site: AFWTF

Location(s): SWMU Location and Background Sampling Location Map and is included in the Workplan.

This document shall be maintained onsite with the Master HSP. It will include as attachments from the Work Plan a site map and the site characterization and objectives for this site.

The procedures described in the Master HSP will be followed unless otherwise specified in this Site-Specific HSP.

1. HAZWOPER-Regulated Tasks

______Test pit and excavation
X_____Soil boring installation
X_____Geoprobe boring
X_____Geophysical surveys
X_____Hand augering
X_____Subsurface soil sampling
X_____Surface soil sampling
______Soil gas surveys
X_____Sediment sampling
X_____Monitoring well/drive point installation
______Monitoring well abandonment
X_____Groundwater sampling
______Aquifer testing
X_____Hydrologic measurements
X_____Surface water sampling
______Biota sampling
X_____Investigation-derived waste (drum) sampling and disposal
______Observation of loading of material for offsite disposal
______Oversight of remediation and construction
______Other____________________

2. Hazards of Concern: (Check as many as are applicable. Refer to Section 3 of Master H&S Plan for control measures):

X_____Heat stress	______Confined space entry
______Cold stress	______Trenches, excavations
______Buried utilities, drums, tanks	______Protruding objects
______Inadequate illumination	X_____Vehicle traffic
X_____Drilling	______Ladders, scaffolds
______Heavy equipment	______Fire
______Working near water	______Working on water
______Flying debris	______Snakes or insects
______Gas cylinders	X_____Poison ivy, oak, sumac
X_____Noise	X_____Ticks
X_____Slip, trip, or fall hazards	______Radiological
X_____Back injury	______Other______________

3. Contaminants of Concern (List if known. Refer to Table 3.8 of the Master HASP contaminant-specific information

PCBs   Metals   VOCs

PNAs   SVOCs

4. Personnel (List CH2M HILL field team members :

Field team leader(s)	Erik Isern
Site safety coordinator(s)	Erik Isern
Field team members	Karen Karvazy, Emiliano Cabale, Hector Hernandez, Joshua Hayes, Allyie Chang

5. Contractors/Subcontractors

X_____Procedures as per Master HASP

X_____Other

Name: To be added ____________________ ____________________

Contact: To be added ____________________ ____________________

Telephone: To be added ____________________ ____________________

6. Level of PPE required:______D__________________
   Refer to Table 5.1 of Master HASP, CH2M HILL SOPs HS-07 and HS-08, and Respiratory Protection, Section 2 of the Site Safety Notebook.

7. Air monitoring instruments to be used (refer to Master HSP for action levels):

   X_____OVM 10.6 ______FID

   ______CGI ______Dust monitor

   ______O_2

8. Decontamination procedures:

   ______As per Section 7 of Master HASP

   X_____Other As described in the SWMU Investigation Workplan.

9. List any other deviations or variations from the Master HASP: None

10. Emergency Response (Check that all names and numbers are correct on page 47 of Master HASP and attach corrected page to this checklist)

11. Map to hospital (Highlight route to hospital from site and attach to this checklist)

12. Emergency Contacts (Check that all names and numbers are correct on page 49 of Master HASP and attach corrected page to this checklist)

13. Approval. This prepared site-specific checklist must be approved by John Longo/NJO or Laura Johnson/NJO or their authorized representative

    Name Title: Health and Safety Manager Date:

    (Signature will be included in the Final HASP)

14. Employee Signoff. All CH2M HILL employees working at the site must sign the attached Employee Signoff for the checklist as well as for the Master HASP.

________________________________ Site

HASP Checklist Employee Signoff

The employees listed below have been given a copy of both this health and safety plan checklist and the Master HSP, have read and understood them, and agree to abide by their provisions.

EMPLOYEE NAME	EMPLOYEE SIGNATURE AND DATE